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CLAIMS

What is claimed is:

1. Apparatus for fabricating a stent, comprising:

a) a platform adapted to receive a flat sheet of metal to be formed into said stent, said flat sheet of metal having a longitudinal axis, a first major surface, a second major surface, a first long side, and a second long side, said first and said second long sides substantially parallel to said longitudinal axis of said sheet;

b) a mandrel having a substantially cylindrical external surface and having a first end and a second end defining a longitudinal axis, said mandrel sized to have a cross-sectional diameter substantially equal to or less than the internal diameter of said stent to be fabricated;

c) means for securing said mandrel against a major surface of said flat sheet of metal; and

d) means for deforming said flat sheet of metal against said external surface of said mandrel so that said flat sheet of metal is deformed into a substantially tubular shape, said means for deforming adapted so that said first long side and said second long side remain substantially parallel to each other when said flat sheet of metal is deformed into said tubular shape.

2. The apparatus of claim 1, further comprising means for securing said first long side of said sheet to said second long side of said sheet.

3. The apparatus of claim 2, wherein said means for securing is a welding apparatus.

4. The apparatus of claim 3, wherein said welding apparatus is a laser.

5. The apparatus of claim 1, wherein said platform is provided with a concave recess to receive said mandrel.

6. The apparatus of claim 1, wherein said means for securing said mandrel is a hingedly connected arm adapted for movement in a first direction toward said platform and in a second direction away from said platform

7. The apparatus of claim 1, wherein the apparatus is adapted to provide a substantially V-shaped notch between said first long side and said second long side when said sheet is deformed into said tubular shape.

8. Apparatus for fabricating a stent, comprising:

a) a base having a platform adapted to receive a flat sheet of metal to be formed into said stent, said flat sheet of metal having a longitudinal axis, a first major surface, a second major surface, a first long side, and a second long side, said first and said second long sides substantially parallel to said longitudinal axis of said stent;

b) a mandrel having a substantially cylindrical external

surface and having a first end and a second end defining a longitudinal axis, said mandrel sized to have a cross-sectional diameter substantially equal to or less than the internal diameter of said stent to be fabricated;

c) means for securing said mandrel against a major surface of said flat sheet of metal;

d) a plurality of deforming blades disposed around the periphery of said mandrel for deforming said flat sheet of metal against said external surface of said mandrel so that said flat sheet of metal is deformed into a substantially tubular shape, said blades disposed between said first end and said second end of said mandrel, each of said deforming blades adapted for independent and selective movement in a first direction toward said mandrel and a second direction away from said mandrel so as to selectively impinge upon said mandrel or upon a portion of said sheet disposed between said mandrel and each of said deforming blades, each of said deforming blades further adapted so that said first long side and said second long side of said sheet remain substantially parallel to each other when said stent is deformed into said tubular shape;

e) means for selectively moving each of said deforming blades in a first direction toward said mandrel and in a second direction away from said mandrel; and

f) means for securing said first long side of said sheet to said second long side of said sheet.

9. The apparatus of claim 8, wherein said means for securing said first long side of said sheet to said second long side of said sheet is a welding apparatus.

10. The apparatus of claim 9, wherein said welding apparatus is a laser.

11. The apparatus of claim 8, wherein said plurality of deforming blades comprises six blades.

12. The apparatus of claim 8, wherein said means for securing said mandrel is a hingedly connected arm adapted for movement in a first direction toward said platform and in a second direction away from said platform

13. The apparatus of claim 8, wherein said base is provided with a first concave recess for receiving said first end of said mandrel and a second concave recess for receiving said second end of said mandrel.

14. The apparatus of claim 8, wherein said means for selectively moving each of said deforming blades is an electric motor.

15. The apparatus of claim 8 further comprising means for controlling the sequence and degree to which each of said blades impinges upon said mandrel or a portion of said sheet disposed

between said mandrel and each of said deforming blades.

16. The apparatus of claim 15, wherein said means for controlling is a computer.

17. The apparatus of claim 8, further comprising an alignment means disposed on said base and adapted to engage and align said metal sheet.

18. The apparatus of claim 8, wherein a plurality of said deforming blades are adapted to secure said first long side and said second long side against said external surface of said mandrel while permitting a laser to contact said first long side and said second long side to secure said first long side to said second long side.

19. The apparatus of claim 18, wherein a plurality of said deforming blades are provided with a plurality of scalloped apertures, said apertures sized and disposed to permit said plurality of blades to secure said first long side and said second long side against said external surface of said mandrel while providing access to said laser to predetermined portions of said first side and said long side to secure said first long side to said second long side.

20. Apparatus for fabricating a stent, comprising:

a) a laser housing;

b) a laser disposed within and selectively movable within said housing;

c) a movable table having a first end and a second end and adapted for selective movement into and out of said laser housing, said table adapted so that when said first end of said table is disposed within said laser housing said second end of said table is disposed outside of said housing and when said second end of said table is disposed within said laser housing said first end of said table is disposed outside of said laser housing;

d) a plurality of stent folders disposed at said first end of said table and a plurality of stent folders disposed at said second end of said table, each of said stent folders comprising:

a) a base having a platform adapted to receive a flat sheet of metal to be formed into said stent, said flat sheet of metal having a longitudinal axis, a first major surface, a second major surface, a first long side, and a second long side, said first and said second long sides substantially parallel to said longitudinal axis, said sheet provided with a plurality of alignment of apertures;

b) a plurality of alignment pins projecting from each of said platforms, said pins sized to engage said alignment apertures and align said sheet on said platform;

c) a mandrel having a substantially cylindrical external surface and having a first end, a second end, and a

longitudinal axis, said mandrel sized to have a cross-sectional diameter substantially equal to or less than the internal diameter of said stent to be fabricated, said platform provided with a first concave recess adapted to receive said first end of said mandrel and a second concave recess adapted to receive said second end of said mandrel;

d) a hingedly connected arm adapted for movement in a first direction toward said platform and in a second direction away from said platform for securing said mandrel against a major surface of said flat sheet of metal;

e) a first deforming blade provided with a first deforming blade tip; a second deforming blade provided with a second deforming blade tip; a third deforming blade provided with a third deforming blade tip; a fourth deforming blade provided with a fourth deforming blade tip; a fifth deforming blade provided with a fifth deforming blade tip; and a sixth deforming blade provided with a sixth deforming blade tip, said blades disposed around said external surface of said mandrel, said deforming blade tips adapted to deform said flat sheet of metal against said external surface of said mandrel so that said flat sheet of metal is deformed into a substantially tubular shape substantially conforming to said external surface, said deforming blades disposed between said first end and said second end of said mandrel, each of said deforming blades adapted for independent and selective movement in a first

direction toward said mandrel and a second direction away from said mandrel so as to selectively impinge said deforming blade tips against said mandrel or upon a portion of said sheet disposed between said mandrel and each of said deforming blade tips, each of said deforming blades further adapted so that said first long side and said second long side of said sheet remain substantially parallel to each other when said stent is deformed into said tubular shape, said third and said sixth deforming blade tips provided with a plurality of scalloped laser apertures, said apertures sized and disposed to permit said third and said sixth deforming blade tips to secure said first long side and said second long side against said external surface of said mandrel while providing said laser access to predetermined portions of said first long side and said second long side in order to weld said first long side to said second long side;

f) a first motor connected to said first deforming blade; a second motor connected to said second deforming blade; a third motor connected to said third deforming blade; a fourth motor connected to said fourth deforming blade; a fifth motor connected to said fifth deforming blade; and a sixth motor connected to said sixth deforming blade, each of said motors adapted for selectively moving each of said deforming blades to which it is connected in a first direction toward said mandrel and in a second

direction away from said mandrel; and

g) a computer for controlling: the sequence which said first end of said table and said second end of said table are disposed within said laser housing; for controlling the sequence and degree to which each of said plurality of deforming blade tips impinges upon said mandrel or a portion of said sheet disposed between said mandrel and each of said deforming blade tips; and for controlling the sequence, pattern, location, and amount of energy said laser applies to each of said first and second long sides of each of said sheets disposed on each of said plurality of stent folders.

21. The apparatus of claim 20, wherein each of said blade deforming tips has a length substantially equal to said first and said second long sides of said flat sheet of metal.

22. The apparatus of claim 20 wherein said deforming blade tips are concave.

23. The apparatus of claim 20 wherein said third deforming blade tip is substantially identical to said sixth deforming blade tip; said second deforming blade tip is substantially identical to said fifth deforming blade tip; and said first deforming blade tip is substantially identical to said fourth deforming blade

tip.

24. Apparatus for fabricating a stent, comprising:

a) a base;

b) a sheet receiving area disposed on said base, said area adapted to receive a flat sheet of metal to be formed into said stent, said flat sheet of metal having a longitudinal axis, a first major surface, a second major surface, a first long side, and a second long side, said first and said second long sides substantially parallel to said longitudinal axis;

c) an arm having a first end and a second end, said first end of said arm adapted to selectively retain a mandrel having a substantially cylindrical external surface, said second end of said arm hingedly connected to said base and adapted for movement in a first direction toward said base and in a second direction away from said base and further adapted to secure said mandrel against a major surface of said flat sheet of metal disposed on said stent receiving area disposed on said base, said mandrel sized to have a cross-sectional diameter substantially equal to or less than the internal cross-sectional diameter of said stent to be fabricated;

d) means for deforming said flat piece of metal against said external surface of said mandrel so that said flat sheet of metal is deformed into a substantially tubular shape substantially conforming to said external surface of said mandrel with said first long side and said second long side substantially

parallel to each other.

25. The apparatus of claim 24, wherein said means for deforming is a member provided with a deforming tip having a length substantially equal to said first and said second long sides of said sheet of metal.

26. The apparatus of claim 24, wherein said deforming tip is concave.

27. A stent aligning and welding jig comprising:

a) a base having a first end and a second end, a first wall having a first end and a second end and a first major surface and a second major surface; a second wall having a first end and a second end and a first major surface and a second major surface, said second major surface of said first wall and said first major surface of said second wall defining a longitudinal U-shaped channel having a longitudinal axis in said base, said first wall provided with a plurality of slots defining a plurality of first clamping portions having a top end and a bottom end and a first major surface and a second major surface, each of said first clamping portions provided with a first concave channel disposed at said top end of said second major surface of said first clamping portion and a second concave channel disposed at said bottom end of said second major surface of said first clamping portion, said first and said second

concave channels substantially parallel to said longitudinal axis of said U-shaped channel; said first wall of each of said plurality of first clamping portions provided with a compensation slit disposed between said first concave channel and said second concave channel, said compensation slit substantially parallel to said longitudinal axis of said U-shaped channel;

b) a plurality of second clamping portions disposed in said U-shaped channel between said second major surface of said first wall and said first major surface of said second wall, each of said second clamping portions disposed in registry with one of said first clamping portions, each of said second clamping portions having a top end, a bottom end, a first major surface, a second major surface, a first minor surface disposed at said top end, a second minor surface disposed at said bottom end, a third minor surface disposed between said top end and said bottom end, and a fourth minor surface disposed opposite said third minor surface between said top end and said bottom end, each of said second clamping portions provided with a first concave channel disposed at said top end of said first major surface of said second clamping portion and a second concave channel disposed at said bottom end of said first major surface of said second clamping portion, said first and said second concave channels substantially parallel to said longitudinal axis of said U-shaped channel;

c) a biasing means disposed between said first major surface of said second wall and said second major surface of each

of said plurality of second clamping portions for biasing said first major surface of each of said second clamping portions against said second major surface of each of said first clamping portions which are in registry with each other;

d) a first mandrel support lever positioning pin projecting from said third minor surface and a second mandrel support lever positioning pin projecting from said fourth minor surface of each of said second clamping portions, said mandrel support lever positioning pins substantially parallel to said longitudinal axis of said U-shaped channel;

e) a biasing control means for selectively controlling the distance between said second major surface of each of said first clamping portions and said first major surface of each of said second clamping portions;

f) a retaining mandrel disposed in said second concave channel of said first wall and said second concave channel in each of said second clamping portions; and

g) a mandrel support lever for supporting said stent during the alignment of said first long side of said sheet with said second long side of said sheet, said lever provided with a first mandrel support notch for supporting said first end of said mandrel, a second mandrel support notch for supporting said second end of said mandrel, a first mandrel support lever positioning pin engagement surface for engaging said first mandrel support lever positioning pin and a second mandrel support lever positioning pin engagement surface for engaging

said second mandrel support lever positioning pin when said mandrel support lever is disposed on said second wall.

28. The apparatus of claim 27, wherein said biasing means is an elastic material.

29. The apparatus of claim 28, wherein said elastic material is rubber.

30. The apparatus of claim 28, wherein said elastic material is a spring.

31. The apparatus of claim 27, wherein said biasing control means is a threaded screw disposed in each of said first clamping portions, each of said screws communicating with said first major surface and said second major surface of each of said first clamping portions and selectively movable in a direction toward and away from said first major surface of said second clamping portion to selectively move said second clamping portion in a direction toward and away from said first clamping portions to selectively vary the distance between said second major surface of each of said first clamping portions and said first major surface of each of said second clamping portions.

32. A method of fabricating a stent comprising the steps of:

a) providing a plurality of stent patterns into a

flat piece of metal, each of said patterns having a first long side and a second long side, said first long side provided with a plurality of pairs of engagement points, said second long side provided with a plurality of pairs of engagement points, said plurality of pairs of engagement points disposed substantially opposite each other, said engagement points sized and disposed to communicate when said pattern is deformed and rolled into a tubular shape, each pair of said first long side engagement points provided with a bridge disposed between each first long side engagement point comprising the pair, said bridge having a width that is less than the width of the other portions of said stent;

b) disposing a mandrel having a substantially cylindrical external surface and a longitudinal axis between said first long side and said second long side of said sheet, said longitudinal axis substantially parallel to said first long side and said second long side;

c) deforming said pattern into a tubular shape so that said first long side pairs of engagement points contact said second long side pairs of engagement points;

d) cutting said bridge; and

e) attaching each of said engagement points to the engagement point with which it is in contact to form said expandable stent.

33. The method of claim 32, wherein said bridge has a width that

is about 25% to about 50% of the width of the other portions of said stent.

34. The method of claim 33, wherein said bridge has a width of about 40 microns.

35. The method of claim 32, wherein said engagement points are sized and adapted to move in an amount sufficient so as to reduce the likelihood of material stress occurring during welding heating and cooling cycles.

36. The method of claim 32, further comprising the step of forming a V-shaped notch between said first long side and said second long side during step c).

37. The method of claim 32, further comprising the step of providing a gap between said engagement points and said external surface of said mandrel during step c).

38. The method of claim 32, comprising the additional step of providing additional weld fill material on the side of each of said engagement points substantially opposite said bridge, said weld fill material sized and disposed so as to permit the additional weld fill material to be drawn into the weld point during welding.

39. The method of claim 32, further comprising the step of providing said sheet with a plurality of alignment apertures.

40. The method of claim 32, wherein step d) is carried out using a laser.

41. The method of claim 32, wherein step e) is carried out utilizing a weld.

42. The method of claim 40, wherein said weld is run from outside-to-in.

43. The method of claim 40, wherein said weld is wider than the other portions of the stent.

44. The method of claim 42, wherein said weld is about 20% wider than the other portions of the stent.

45. The method of claim 41, wherein said weld has a width of about 140 microns.

46. The method of claim 41, wherein step e) is carried out using a welding run that is offset from the point where said engagement points contact each other.

47. The method of claim 41, wherein step e) is carried out using

a plurality of welding runs.

48. The method of claim 47, wherein two welding runs are utilized.

49. The method of claim 46, wherein said weld run is offset about .01 mm from the point where said engagement points contact each other.

50. The method of claim 42, wherein said weld is a spot weld.

51. The method of claim 50, wherein a plurality of spot welds is utilized.

52. The method of claim 51, wherein 5 spot welds are utilized.

53. The method of claim 34, further comprising the step of electropolishing the stent.

54. The method of claim 34, wherein step e) is carried out utilizing an adhesive.

55. The method of claim 34, wherein step e) is carried out utilizing a nail-like element.

56. The method of claim 34, wherein said pattern in cut into

said stent using multiple-up-etching.

57. The method of step 34, further comprising the step of inspecting both sides of said sheet after step a) and before step b).

58. The method of claim 57, wherein said inspection step is carried out using an automated optical inspection apparatus.

59. A jig for electropolishing a tubular stent, comprising:

a rack having a first end and a second end, said rack provided with a plurality of stent electropolishing mounts, each of said mounts having

a) a base;

b) an electrically conductive first member having a first end connected to said base and a second end adapted to selectively contact the external surface of said tubular stent without damaging said external surface;

c) an electrically non-conductive second member having a first end connected to said base and a second end adapted to be selectively disposed within the longitudinal bore of said stent without damaging said longitudinal bore, said first member and said second member further adapted so as to bias said second end of said second member towards said second end of said first member in an amount sufficient to secure said stent between said first and said second members.

60. A method of electropolishing a stent, comprising the steps of:

a) mounting a stent on a rack, said rack having a first end and a second end provided with a plurality of stent electropolishing mounts, each of said mounts having a base; an electrically conductive first member having a first end connected to said base and a second end adapted to selectively contact the external surface of said tubular stent without damaging said external surface; an electrically non-conductive second member having a first end connected to said base and a second end adapted to be selectively disposed within the longitudinal bore of said stent without damaging said longitudinal bore, said first member and said second member further adapted so as to bias said second end of said second member towards said second end of said first member in an amount sufficient to secure said stent between said first and said second members;

b) immersing said stent in an electropolishing bath and applying electrical current to said first member for a predetermined period of time; and

c) changing the point where said second end of said first member contacts said external surface of said stent prior to the expiration of said predetermined period of time.

61. The method of claim 60, wherein point of contact is changed by rotating said stent.

62. The method of claim 60, wherein the point of contact is changed by varying the distance between said stent and said base.

63. The method of claim 60, wherein the point of contact is changed at about the midpoint of the predetermined period of time.

64. The method of claim 60, further comprising the step of interrupting the treatment before the expiration of the predetermined time, evaluating the effect of the electropolishing prior to the interruption step, and adjusting the remaining period of the predetermined time to compensate for any variations in the amount of material actually removed prior to the interruption step.

65. The method of claim 60, wherein the treatment is interrupted at about the midpoint of said predetermined period of time.

66. The method of claim 60, further comprising the step of adding pieces of sacrificial material at said first end and said second end of said rack to substantially compensate for the additional material normally removed from stents disposed at said first end and said second end of said rack, said material selected and added in an amount sufficient to substantially equalize the amount of additional material normally removed from the stents disposed at said first end and said second end of said

rack.

67. A method of fabricating a stent having a longitudinal lumen comprising the steps of:

a) providing a plurality of stent patterns in a flat sheet of metal; each of said patterns having a first long side and a second long side, said first long side provided with a plurality of pairs of engagement points, said second long side provided with a plurality of pairs of engagement points, said plurality of pairs of engagement points disposed substantially opposite each other, said engagement points sized and disposed to communicate when said pattern is deformed and rolled into a tubular shape, each pair of said first long side engagement points provided with a bridge disposed between each first long side engagement point comprising said pair, said bridge having a width that is less than the width of the other portions of said stent;

b) disposing a mandrel having a substantially cylindrical external surface and a longitudinal axis between said first long side and said second long side of said sheet, said longitudinal axis substantially parallel to said first and said second long sides;

c) deforming said pattern into a tubular shape so that said first long side pairs of engagement points contact said second long side pairs of engagement points and allowing a portion of said stent to remain attached to said sheet of metal;

d) cutting said bridge;

e) attaching each of said engagement points to the engagement point with which it is in contact to form said stent;

f) attaching an electrode to said sheet of metal;

g) electropolishing said stent; and

f) disconnecting said stent from said sheet.

68. The method of claim 67, wherein said bridge has a width that is about 25% to about 50% of the width of the other portions of said stent.

69. The method of claim 67, wherein said bridge is provided with a width of about 40 microns.

70. The method of claim 67, wherein said engagement points are sized and adapted to move in an amount sufficient so as to reduce the likelihood of material stress occurring during welding heating and cooling cycles.

71. The method of claim 67, comprising the additional step of providing additional weld fill material on the side of said engagement points substantially opposite said bridge, said weld fill material sized and disposed at said engagement points so as to permit the additional weld fill material to be drawn into the weld point during welding.

72. The method of claim 67, further comprising the step of

forming a V-shaped notch between said first long side and said second long side during step c).

73. The method of claim 67 further comprising the step of providing a gap between said engagement points and said external surface of said mandrel during step c).

74. The method of claim 67, further comprising the step of providing said sheet with a plurality of alignment apertures.

75. The method of claim 67, wherein step d) is carried out using a laser.

76. The method of claim 67, wherein step e) is carried out utilizing a weld.

77. The method of claim 76, wherein said weld is run from outside-to-in.

78. The method of claim 76, wherein said weld is wider than the other portions of the stent.

79. The method of claim 78, wherein said weld is about 20% wider than the other portions of the stent.

80. The method of claim 76, wherein said weld has a width of

about 140 microns.

81. The method of claim 76, wherein step e) is carried out using a weld-run that is offset from the point where said engagement points contact each other.

82. The method of claim 76, wherein step e) is carried out using a plurality of welding runs.

83. The method of claim 82, wherein two welding runs are utilized.

84. The method of claim 81, wherein said weld run is offset about .01 mm from the point where said engagement points contact each other.

85. The method of claim 76, wherein said weld is a spot weld.

86. The method of claim 76, wherein a plurality of spot welds is utilized.

87. The method of claim 86, wherein said plurality of spot welds comprises 5 spot welds.

88. The method of claim 67, wherein step e) is carried out utilizing an adhesive.

89. The method of claim 67, wherein step e) is carried out utilizing a nail-like element.

90. The method of claim 67, wherein said pattern in cut into said stent using multiple-up-etching.

91. The method of claim 67, further comprising the step of inspecting both sides of said sheet after step a) and before step b).

92. The method of claim 91, wherein said inspection step is carried out using an automated optical inspection apparatus.

93. The method of claim 67, wherein said stent patterns are adapted so that upon expansion of said stent against the internal wall of a vessel substantially no portion of said stent protrudes into said longitudinal lumen of said stent.

94. A sheet for fabricating a stent having a longitudinal lumen comprising:

a) a flat piece of sheet metal provided with a plurality of stent patterns, each of said patterns having a first long side and a second long side, said first long side provided with a plurality of pairs of engagement points, said second long side provided with a plurality of pairs of engagement points, said plurality of pairs of engagement points disposed

substantially opposite each other, said engagement points sized and disposed to communicate when said pattern is deformed and rolled into a tubular shape, each pair of said first long side engagement points provided with a bridge disposed between each first long side engagement point comprising said pair, said bridge having a width that is less than the width of the other portions of the stent.

95. The sheet of claim 94, wherein said bridge has a width that is about 25% to about 50% of the width of the other portions of said stent.

96. The sheet of claim 94, wherein said bridge has a width of about 40 microns.

97. The sheet of claim 94, wherein said engagement points are sized and adapted to move in an amount sufficient so as to reduce the likelihood of material stress occurring during welding heating and cooling cycles.

98. The sheet of claim 94, further comprising, additional weld fill material on the side of each of said engagement points substantially opposite said bridge, said weld fill material sized and disposed so as to permit the additional weld fill material to be drawn into the weld point during welding.

99. The sheet of claim 94, further comprising a plurality of alignment apertures disposed in said sheet.

100. The sheet of claim 94, wherein said stent patterns are adapted so that upon expansion of said stent against the internal wall of a vessel substantially no portion of said stent protrudes into said longitudinal lumen of said stent.

101. A method for fabricating a stent having a longitudinal lumen, comprising the steps of:

a.) constructing an apparatus comprising:

a) a laser housing;

b) a laser disposed within and selectively movable within said housing;

c) a movable table having a first end and a second end and adapted for selective movement into and out of said laser housing said table adapted so that when said first end of said table is disposed within said laser housing said second end of said table is disposed outside of said housing and when said second end of said table is disposed within said laser housing said first end of said table is disposed outside of said laser housing;

d) a plurality of stent folders disposed at said first end of said table and a plurality of stent folders disposed at said second end of said table, each of said stent folders comprising:

a) a base having a platform adapted to receive a flat sheet of metal to be formed into said stent, said flat sheet

of metal having a longitudinal axis, a first major surface, a second major surface, a first long side, and a second long side, said first and said second long sides substantially parallel to said longitudinal axis, said sheet provided with a plurality of alignment of apertures;

b) a plurality of alignment pins projecting from each of said platforms, said pins sized to engage said alignment apertures and align said sheet on said platform;

c) a mandrel having a substantially cylindrical external surface and having a first end, a second end, and a longitudinal axis, said mandrel sized to have a cross-sectional diameter substantially equal to or less than the internal diameter of said stent to be fabricated, said platform provided with a first concave recess adapted to receive said first end of said mandrel and a second concave recess adapted to receive said second end of said mandrel;

d) a hingedly connected arm adapted for movement in a first direction toward said platform and in a second direction away from said platform for securing said mandrel against a major surface of said flat sheet of metal;

e) a first deforming blade provided with a first deforming blade tip; a second deforming blade provided with a second deforming blade tip; a third deforming blade provided with a third deforming blade tip; a fourth deforming blade provided with a fourth deforming blade tip; a fifth deforming blade provided with a fifth deforming

blade tip; and a sixth deforming blade provided with a sixth deforming blade tip, said blades disposed around said external surface of said mandrel, said deforming blade tips adapted to deform said flat sheet of metal against said external surface of said mandrel so that said flat sheet of metal is deformed into a substantially tubular shape substantially conforming to said external surface, said deforming blades disposed between said first end and said second end of said mandrel, each of said deforming blades adapted for independent and selective movement in a first direction toward said mandrel and a second direction away from said mandrel so as to selectively impinge said deforming blade tips against said mandrel or against a portion of said sheet disposed between said mandrel and each of said deforming blade tips, each of said deforming blades further adapted so that said first long side and said second long side of said sheet remain substantially parallel to each other when said stent is deformed into said tubular shape, said third and said sixth deforming blade tips provided with a plurality of scalloped laser apertures, said apertures sized and disposed to permit said third and said sixth deforming blade tips to secure said first long side and said second long side against said external surface of said mandrel while providing said laser access to predetermined portions of said first long side and said second long side of said sheet in order to weld said first

long side to said second long side;

f) a first motor connected to said first deforming blade; a second motor connected to said second deforming blade; a third motor connected to said third deforming blade; a fourth motor connected to said fourth deforming blade; a fifth motor connected to said fifth deforming blade; and a sixth motor connected to said sixth deforming blade, each of said motors adapted for selectively moving each of said deforming blades to which it is connected in a first direction toward said mandrel and in a second direction away from said mandrel; and

g) a computer for controlling: the sequence which said first end of said table and said second end of said table are disposed within said laser housing; for controlling the sequence and degree to which each of said plurality of deforming blade tips impinges upon said mandrel or a portion of said sheet disposed between said mandrel and each of said deforming blade tips; and for controlling the sequence, pattern, location, and amount of energy said laser applies to each of said first and said second long sides of each of said sheets disposed on each of said plurality of stent folders;

b.) cutting a plurality of stent patterns into a flat piece of metal, each of said patterns having a first major surface and a second major surface, a first long side and a second long side,

said first long side provided with a plurality of pairs of engagement points, said second long side provided with a plurality of pairs of engagement points, said plurality of pairs of engagement points disposed substantially opposite each other, said engagement points sized and disposed to communicate when said pattern is deformed and rolled into a tubular shape, each pair of said first long side engagement points provided with a bridge disposed between each first long side engagement point comprising the pair, said bridge having a width that is less than the width of the other portions of the stent, said sheet provided with a plurality of alignment apertures sized and disposed to engage said alignment pins on said base;

c.) disposing said sheet on said base so that said first major surface of said sheet is in contact with said base;

d.) disposing a mandrel having a substantially cylindrical external surface and a longitudinal axis against said second major surface of said sheet between said first long side and said second long side of said sheet, said longitudinal axis substantially parallel to said first long side and said second long side;

e.) deforming said pattern into a tubular shape so that said first long side pairs of engagement points contact said second long side pairs of engagement points said deforming step comprising the steps of:

a) actuating said sixth deforming blade motor so that said sixth deforming blade motor moves said sixth

deforming blade in said first direction in an amount sufficient for said sixth deforming blade tip to contact said external surface of said mandrel so as to secure said mandrel against said sheet;

b) actuating said first deforming blade motor so that said first blade deforming motor moves said first deforming blade in said first direction in an amount sufficient for said first blade deforming tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

c) actuating said second deforming blade motor so that said second deforming blade motor moves said second deforming blade in said first direction in an amount sufficient for said second deforming blade tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

d) actuating said third deforming blade motor so that said third deforming blade motor moves said second deforming blade in said first direction in an amount sufficient for said third deforming blade tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel while actuating said sixth deforming blade motor so that said sixth deforming blade moves in said

second direction away from said mandrel;

e) actuating said fourth deforming blade motor so that said fourth deforming blade motor moves said fourth deforming blade tip in said first direction in an amount sufficient for said fourth deforming blade tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

f) actuating said fifth deforming blade motor so that said fifth deforming blade motor moves said fifth deforming blade in said first direction in an amount sufficient for said fifth deforming blade tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

g) actuating said sixth deforming blade motor so that said sixth deforming blade motor moves said second deforming blade in said first direction in an amount sufficient for said second deforming blade tip to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

h) simultaneously actuating said third and sixth deforming blade motors so that said third and sixth deforming blade motors move said third and sixth deforming blades in said first direction in an amount

sufficient for said third and sixth deforming blade tips to contact said first major surface of said sheet and deform said sheet against said external surface of said mandrel;

d) utilizing said laser in cutting said bridge; and

e) utilizing said laser in welding each of said engagement points to the engagement point with which it is in contact to form said expandable stent.

102. The method of claim 101, wherein said bridge has a width that is about 25% to about 50% of the width of the other portions of said stent.

103. The method of claim 101, wherein said bridge has a width of about 40 microns.

104. The method of claim 101, wherein said engagement points are sized and adapted to move in an amount sufficient so as to reduce the likelihood of material stress occurring during welding heating and cooling cycles.

105. The method of claim 101, further comprising the step of forming a V-shaped notch between said first long side and said second long side during step e).

106. The method of claim 101, further comprising the step of

providing a gap between said engagement points and said external surface of said mandrel during step e).

107. The method of claim 101, comprising the additional step of providing additional weld fill material on the side of each of said engagement points substantially opposite said bridge, said weld fill material sized and disposed so as to permit the additional weld fill material to be drawn into the weld point during welding.

108. The method of claim 101, wherein step d) is carried out using a laser.

109. The method of claim 101, wherein step e) is carried out utilizing a weld.

110. The method of claim 109, wherein said weld is run from outside-to-in.

111. The method of claim 109, wherein said weld is wider than the other portions of the stent.

112. The method of claim 111, wherein said weld is about 20% wider than the other portions of the stent.

113. The method of claim 109, wherein said weld has a width of

about 140 microns.

114. The method of claim 109, wherein step e) is carried out using a weld-run that is offset from the point where said engagement points contact each other.

115. The method of claim 109, wherein step e) is carried out using a plurality of welding runs.

116. The method of claim 115, wherein two weld-runs are utilized.

117. The method of claim 114, wherein said weld run is offset about .01 mm from the point where said engagement points contact each other.

118. The method of claim 109, wherein said weld is a spot weld.

119. The method of claim 109, wherein a plurality of spot welds is utilized.

120. The method of claim 119, wherein said plurality of spot welds comprises 5 spot welds.

121. The method of claim 101, further comprising the step of electropolishing the stent.

122. The method of claim 101, wherein step e) is carried out utilizing an adhesive.

123. The method of claim 101, wherein step e) is carried out utilizing a nail-like element.

124. The method of claim 101, wherein said pattern in cut into said stent using multiple-up-etching.

125. The method of step 101, further comprising the step of inspecting both sides of said sheet after step a) and before step b).

126. The method of claim 125, wherein said inspection step is carried out using an automated optical inspection apparatus.

127. The method of claim 101, wherein said stent patterns are added so that upon the expansion of said stent against the internal wall of a vessel substantially no portion of said stent projects into said longitudinal lumen.

128. A stent having a longitudinal lumen comprising:

a first long side and a second long side, said first long side provided with a plurality of pairs of engagement points, said second long side provided with a plurality of pairs of engagement points, said plurality of pairs of first long side engagement points and said plurality of pairs of second long side engagement points disposed substantially opposite each other and connected to each other via a weld, said weld wider than the other portions of said stent.

129. The stent of claim 128, wherein said weld is run from outside-to-in.

130. The stent of claim 128, wherein said weld is about 20% wider than the other portions of the stent.

131. The stent of claim 128, wherein said weld has a width of about 140 microns.

132. The stent of claim 128, wherein said weld is comprised of a plurality of weld runs.

133. The stent of claim 132, wherein said weld is comprised of two weld runs.

134. The stent of claim 128, wherein said weld is a spot weld.

135. The stent of claim 128, wherein said weld comprises a plurality of spot welds.

136. The stent of claim 135, wherein said plurality of spot welds comprises 5 spot welds.

137. The stent of claim 128, wherein said stent patterns are adapted so that upon the expansion of said stent against the internal wall of a vessel substantially no portion of said stent protrudes into said longitudinal lumen of said stent.